LONGBOW HELLFIRE

Army ACAT IC Program

Total Number of Systems:	12,905
Total Program Cost (TY$):	$2.51B
Average Unit Cost (TY$):	$162.1K
Full-rate production:	1QFY98

Prime Contractor

Lockheed Martin/Northrop Grumman

SYSTEM DESCRIPTION & CONTRIBUTION TO JOINT VISION 2010

The Longbow Hellfire missile is a fire-and-forget version of the Hellfire anti-tank, air-to-ground missile. The Longbow Hellfire features an active radio frequency seeker operating in the millimeter wave frequency band, and a dual tandem warhead designed to defeat reactive armor. Either the AH-64D's Fire Control Radar or a laser designator may designate targets for the missile. The Longbow Hellfire can engage both moving and stationary vehicles.

The Longbow Hellfire missile will provide an adverse weather, fire-and-forget, heavy anti-armor capability for the Army's AH-64D Longbow Apache attack helicopter. The Longbow Hellfire is a tactical ***precision engagement*** weapon that enhances the Army's ability to dominate ground maneuver battle.

BACKGROUND INFORMATION

A combined Longbow Apache and Longbow Hellfire IOT&E was conducted in 1995. The gunnery phase of IOT&E was conducted from January-February 1995, at the Naval Weapons Center, China Lake, CA. This phase of testing compared the Longbow Apache firing the Longbow and Semi-Active Laser (SAL) missiles with the baseline AH-64A firing the SAL missile in obscured and unobscured conditions. The force-on-force phase of IOT&E was conducted at Ft. Hunter Liggett, CA, during March 1995. The objectives of this phase were to assess the operational effectiveness of an attack helicopter company equipped with the Longbow weapon system relative to one equipped with the current AH-64A, and the operational suitability of the aircraft. Both the test and baseline attack helicopter companies conducted missions against a battalion-size enemy force, augmented with an appropriate slice of air defenses. A real-time casualty assessment system was used for kill removal.

One issue uncovered during IOT&E that required follow-on testing involved a method of employment for the Longbow Hellfire missile. During the IOT&E's force-on-force phase, Longbow Apache crews frequently overrode the system's automatic firing mode selection and fired missiles from a masked position using the Lock-On Before Launch Inhibit (LOBL-I) firing mode. This powerful technique significantly increased the helicopter's survivability, but had not been validated with live missile firings during preceding DT/OT.

The DAB authorized LRIP of the Longbow Hellfire missile in October 1995. The attendant ADM dated October 18, 1995, required OSD approve the Army's plan to test the LOBL-I mode of engagement. The ADM also stated that testing would culminate with missile firings at moving targets.

The decision for full-rate production of the missile, delegated to the Army by OSD, was made in November 1997, with a commitment to continue to test fire using the LOBL-I engagement technique.

TEST & EVALUATION ACTIVITY

OSD (DOT&E) worked with the Army to develop a plan for a Follow-On Test (FOT) of the LOBL-I engagement to confirm system performance using this firing technique. The test program included digital simulations of the missile's target acquisition and fly-out, Hardware- in-the Loop (HWIL) testing of the guidance section, low-speed captive flight test (LSCFT) of the missile seeker, and live missile firings at moving armored vehicles. The simulations, LSCFT, and four of the planned eight missile firings were completed in FY99.

TEST & EVALUATION ASSESSMENT

IOT&E and LFT&E were conducted in accordance with the approved TEMP (September 1994). As reported to Congress in the October 1995 B-LRIP report, these tests were adequate to provide information necessary to determine the entire Longbow Apache Weapons System operationally effective, suitable, and survivable. Specifically, the AH-64D armed with the Longbow Hellfire was found to be substantially more effective than the AH-64A Apache armed with the SAL Hellfire. During the gunnery phase, the AH-64D was able to acquire and effectively engage targets in obscuration that precluded engagement by the AH-64A. During force-on-force testing, the AH-64D force was significantly more lethal and survivable than the AH-64A force.

The LOBL-I FOT is an innovative use of modeling and simulation (M&S) in support of OT&E. In this instance, M&S was used to characterize the missile's performance in the LOBL-I mode in a far wider range of conditions than could be examined just using field testing. Factors such as target range and time delay (the time between locating the target and firing the missile) were varied based on what was observed during IOT&E's force-on-force test results. Only after the M&S results were analyzed were informative cases selected for LSCFT and live fire missile shots. The results from LSCFT and the missile firings were then compared to the M&S predictions to validate the simulation models. Further, this was a noteworthy example of field test results (from the IOT&E) supporting M&S (digital, HWIL, and LSCFT), the results of which support field testing (live missile shots).

Four shots of the scheduled eight-shot FOT were completed in November 1998. During these missile firings, software anomalies in the missile seeker were detected, leading to the suspension of the remaining missile firings. Since then, funding interruptions have delayed software development and affected the test schedule. Consequently, LSCFT of the missile seeker with the revised software and the completion of the remaining missile firings—which were to be completed during FY99—were delayed until 1QFY00.

Despite the delays, the data from the digital and HWIL simulations, LSCFT, and missile firings conducted to date have identified factors that significantly affect the missile's probability of acquiring and hitting the target when fired in the LOBL-I mode. These factors include target range, time delay (the time between locating the target and firing the missile) and target radial velocity (target speed and aspect angle). These emerging results do not alter DOT&E's assessment that the Longbow Apache and Longbow Hellfire Missile are operationally effective, suitable, and survivable. However, FOT results are expected to cause the Army to review AH-64D tactics, techniques, and procedures to reflect the lessons learned during this phase of testing.

LESSONS LEARNED

As explained above, Longbow Apache crews frequently used the LOBL-I method of engagement during the IOT&E's force-on-force phase to fire missiles from a masked position and thereby reduce their susceptibility to engagement by threat air defense systems. The crews' clear preference for this mode was not discovered until the aircrews encountered a sufficiently realistic air defense threat environment during IOT&E.

The Army's (PM Longbow Hellfire and Apache) approach to subsequent LOBL-I testing, to investigate the impact of that mode on the missiles probability of hit, was a good example of using M&S to support OT&E. Importantly, however, the program illustrates the criticality of confirming M&S results with field testing. The software anomalies that led to the suspension of live missile shots would not have been detected or the subsequent revision of the missile seeker software implemented otherwise.